PATENT
1163-0345P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: YOSHIDA, Kenji et al

Appl. No.: NEW Group:

Filed: July 16, 2001 Examiner:

For: ACOUSTIC WAVE APPARATUS

#1
10-25-01

INFORMATION DISCLOSURE STATEMENT
(SUBMISSION CONCURRENT WITH THE
FILING OF A NEW PATENT APPLICATION)

Assistant Commissioner for Patents
Washington, DC 20231

July 16, 2001

Sir:

Pursuant to 37 C.F.R. §§ 1.97 and 1.98, applicant(s) hereby submit(s) an Information Disclosure Statement for consideration by the Examiner.

I. LIST OF PATENTS, PUBLICATIONS OR OTHER INFORMATION

The patents, publications, or other information submitted for consideration by the Office are listed on PTO-1449, attached hereto.

II. COPIES

☒ Submitted herewith is a legible copy of (i) each U.S. and foreign patent; (ii) each publication or that portion which caused it to be listed; and (iii) all other information or that portion which caused it to be listed.

☐ This application is a National Phase of a PCT application. Some or all of the documents listed on the PTO-1449 are not enclosed because they were cited in the International Search Report and copies should be forwarded from the International Search Authority. If copies are needed, please contact the undersigned.

III. CONCISE EXPLANATION OF THE RELEVANCE
(check at least one box)

a. ☐ **DOCUMENTS IN THE ENGLISH LANGUAGE**

The attached patents, publications, or other information in the English language do not require a statement of relevancy.

b. ☒ **DOCUMENTS NOT IN THE ENGLISH LANGUAGE**

A concise explanation of the relevance of all patents, publications, or other information listed that is not in the English language is as follows:

The relevancy of the Japanese language documents can be determined by a review of either, the English language abstract attached thereto or the enclosed partial translation of the relevant portions thereof.

c. ☐ **ENGLISH LANGUAGE SEARCH REPORT**

An English language version of the search report or action that indicates the degree of relevance found by the foreign office is attached, thereby satisfying the requirement for a concise explanation. See MPEP 609(A)(3).

d. ☐ **OTHER**

The following additional information is provided for the Examiner's consideration.

Docket No. 1163-0345P

FEES

This Information Disclosure Statement is being filed concurrently with the filing of a new patent application; therefore, no fee is required.

If The Examiner has any questions concerning this IDS, he/she is requested to contact the undersigned. If it is determined that this IDS has been filed under the wrong rule, the PTO is requested to consider this IDS under the proper rule and charge the appropriate fee to Deposit Account No. 02-2448.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By #35,054
Michael K. Mutter, #29,680

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

MKM/tf
1163-0345P

Enclosures:
- ☒ Form PTO-1449(s)
- ☒ Documents
- ☐ Foreign Search Report
- ☐ Fee
- ☒ Other: International Search Report

(Rev. 01/22/01)

PRIOR ART DOCUMENTS

1. JP-A 5-315886

   Publication date: November 26, 1993

2. JP-A 9-167936

   Publication date: June 24, 1997

This publication is cited in the International Search Report

3. JP-A 9-153756

   Publication date: June 10, 1997

4. "Journal of Institute of Electronics and Communication Engineers of Japan", 84/1, Vol.J67-C, No.1

   Title: SSBW and Leaky SAW Propagating on Rotated Y-Cuts of $LiNbO_3$ and $LiTaO_3$

   This document is described in the specification of the present application.

Translation of the Relevant Part

SUMMARY For θ (36 degrees)-rotated Y-cut $LiTaO_3$ and θ (41 degrees)-rotated Y-cut $LiNbO_3$, which are known as SSBW cut, and θ (64 degrees)-rotated Y-cut $LiNbO_3$ in which the attenuation of leaky SAW (LSAW) on a short surface is low, conditions, in which SSBW or LSAW exists as a main propagation wave, are examined. In cases where a propagation speed difference between SSBW and LSAW is very small (lower than 1 to 2 m/s) at a propagation distance ranging from 5o to 500 waves normally set by devices, SSBW exists as a main propagation wave. In contrast, in cases where a propagation speed difference between SSBW and LSAW is comparatively large (higher

than 13 m/s), LSAW exists as a main propagation wave.

5. "Surface Acoustic Wave Technology" edited by Institute of Electronics and Communication Engineers of Japan

Title: Excitation of Surface Acoustic Wave

This document is described in the specification of the present application.

Translation of the Relevant Part

4.2 Direct Excitation Method

4.2.1 Excitation in piezoelectric crystal plate

(1) Reed screen shaped electrode transducer

A plurality of electrodes, which are formed in reed screen shape as shown in Fig. 4.3, are arranged on a surface of a substrate formed of piezoelectric crystal according to a mask deposition or a photo-etching, and electric field of a frequency f is applied to the reed screen shaped electrodes. Therefore, the substrate surface is distorted because of the piezoelectric effect. As shown in Fig. 4.3, an electrode width is set to h, a space is set to a, a center distance between electrodes is set to d (d=a+h), and a speed of surface acoustic waves is set to v. Because the phase of a wave having a center frequency f_0 ($=v/\lambda_0=v/2(a+h)$) agrees with that of the electric field, the wave of the center frequency f_0 is most strongly excited in the reed screen shaped electrodes and is received at the highest sensibility.

6. "Recent Research of Elastic Wave Device Technique"

Title: Simulation of SAW Devices By the Discrete Green Function

This document is described in the specification of the

present application.

Translation of the Relevant Part

1 PREFACE

A discrete Green function is used to estimate propagation and excitation characteristics of waves in a metal grating having an infinite length, and an impulse model is finally derived. In this function, not only the influence of an electric reaction and bulk wave radiation is considered, but also the influence of mass load can be considered.

7. "Recent Research of Elastic Wave Device Technique"

Title: Simple Mathematical Model for Leaky-SAW Resonator Simulation

This document is described in the specification of the present application.

Translation of the Relevant Part

1 PREFACE

A discrete Green function is used to estimate propagation and excitation characteristics of waves in a metal grating having an infinite length, and an impulse model is finally derived. In this function, not only the influence of an electric reaction and bulk wave radiation is considered, but also the influence of mass load can be considered. Writes propose a method of determining COM parameters based on the discrete Green function method. In this method, the contribution of the generation of reflected waves is humanly removed, dispersion characteristics of traveling waves and electro-mechanical coupling coefficients are calculated, and the COM parameters are determined according to the change of dispersion characteristics of the reflected waves.

8. "23th EM Symposium"

Title: Leaky SAW and SH SAW - Comparison with Rayleigh SAW

This document is described in the specification of the present application.

Translation of the Relevant Part

1 PREFACE

In Section 2, natural modes of R-SAW and L-SAW and general physical properties of bulk waves such as SSBW are studied. In Section 3, the influence of the physical properties on propagation characteristics in a metallic grating represented by a reflector is examined.

9. "Handbook of Elastic Wave Device Technique"

This document is described in the specification of the present application.

Translation of the Relevant Part

2nd Chapter Excitation and Reception of Surface Acoustic Wave

2.2 Surface acoustic wave transducer using reed screen shaped electrodes

(b) Equivalent circuit model

In the conventional analyzing method, when surface acoustic wave, which is generated in electrodes formed in reed screen shape, propagates under the electrodes, it is assumed that the electrodes do not influence acoustically or piezo-electrically on the surface acoustic wave. However, because of the reaction of the piezoelectric, the surface acoustic wave is returned to an electric supply source through the electrodes, and a signal of the surface acoustic wave is returned to the electrodes to produce a surface wave signal. Also, because acoustic impedance

becomes discontinuous by the reed screen shaped electrodes arranged on the propagation path, a part of the surface acoustic wave is reflected. Therefore, propagation characteristics are changed. These conditions are considered in the equivalent circuit model of Smith.

As shown in Fig. 3.65, the reed screen shaped electrodes arranged on the propagation path has electrode portions (lm) and space portions (lg). Therefore, because acoustic impedance becomes discontinuous, when the surface acoustic wave propagates the electrodes, a part of the surface acoustic wave is reflected. This reflection can be calculated by serially inserting a ratio $\tau = Z_0/Zm = 1/\sqrt{(1-K^2)}$ into an equivalent circuit. Here, Z_0 indicates an acoustic impedance obtained from a sound speed in case of surface free. Zm indicates an impedance in case of the surface short. This model is called the "2nd model of Smith" and is shown in Fig. 3.76. The 2nd model of Smith is useful as a model near to experiments.

10. "Handbook of Elastic Wave Device Technique"

This document is described in the specification of the present application.

Translation of the Relevant Part

3.2 Resonator

3.2.2 Characteristics of resonator

[1] Analyzing method

(b) Equivalent circuit method

As shown in Fig. 3.134, a grating reflector area is indicated by a transmission path in which a characteristic admittance periodically mismatches, a reed screen shaped electrode area is indicated by the equivalent circuit of Smith, and

characteristics of the SAW resonator is analyzed. This analyzing method is fundamentally the same as the analysis of the SAW filter based on the equivalent circuit method in which acoustic reflection is considered.

CO-PENDING APPLICATION in US

USSN 09/800,929 filed on March 8, 2001
Your Ref.: 1163-0328P
Our Ref.: 00135-US
MITSUBISHI Ref.: 517242-US-01